

Alg. 2 Warm Up # 7-1

Evaluate the logarithms:

$$1. \log_2 8 \qquad 2. \log_2 \frac{1}{4} \qquad 3. \log_{\frac{1}{2}} \frac{1}{4}$$

$$4. \log_{\frac{1}{2}} 8 \qquad 5. \log_3 \frac{1}{9} \qquad 6. \log_3 1$$

Review & Preview

6-113. Solve each of the following equations to the nearest 0.001.

a. $(5.825)^{(x-3)} = 120$

b. $18(1.2)^{(2x-1)} = 900$

$$\log(5.825)^{(x-3)} = \log 120$$

$$\frac{(x-3)(\cancel{\log 5.825})}{(\cancel{\log 5.825})} = \frac{\log 120}{\log 5.825}$$

$$\cancel{x-3} + 3 = \frac{\log 120}{\log 5.825} + 3$$

$$x \approx 5.717$$

6-114. Simplify each expression below. If you are stuck, the ideas in problem 6-74 should be helpful.

a. $\frac{x}{1 - \frac{1}{x}}$

$$= \frac{\frac{x}{1}}{\frac{x}{x} - \frac{1}{x}}$$

$$\frac{\frac{x}{1}}{\frac{x-1}{x}}$$

$$\frac{x}{1} \cdot \frac{x}{x-1}$$

$$\boxed{\frac{x^2}{x-1}}$$

b. $\frac{\frac{1}{a} + \frac{1}{b}}{\frac{1}{b} - a}$

$$\frac{\frac{b}{b} \cdot \frac{1}{a} + \frac{1}{b} \cdot \frac{a}{a}}{\frac{1}{b} - \frac{a}{1} \cdot \frac{b}{b}}$$

$$\frac{\frac{b+a}{ab}}{\frac{1-ab}{b}}$$

$$\frac{(b+a)}{ab} \cdot \frac{b}{(1-ab)}$$

$$\boxed{\frac{(a+b)}{a(1-ab)}}$$

6-115. Use the definition of a logarithm to change $\log_2 7$ into a logarithmic expression of base 5.

$$\log_2 7 = x$$

$$2^x = 7$$

$$\log_2 7 = \log_5 (?)$$

$$\log_5 2^x = \log_5 7$$

$$x \log_5 2 = \log_5 7$$

$$\log_2 7 = \frac{\log_5 7}{\log_5 2}$$

$$\log_2 7 = \frac{\log_{10} 7}{\log_{10} 2}$$

$$\log_2 7 \approx 2.8$$

- 6-119. Use the ideas developed in problem 6-118 to change each of the following quadratic equations into graphing form. Identify the vertex and the line of symmetry for each one.

a. $f(x) = 4x^2 - 12x + 6$ \rightarrow b. $g(x) = 2x^2 + 14x + 4$ \rightarrow

$$f(x) = 4\left(x^2 - 3x + \frac{9}{4}\right) + 6 - 9$$

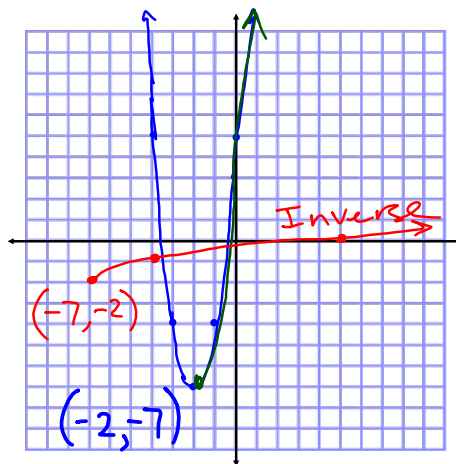
$$\left(-\frac{3}{2}\right)^2$$

$$f(x) = 4\left(x - \frac{3}{2}\right)^2 - 3$$

vertex: $\left(\frac{3}{2}, -3\right)$
axis of sym: $x = \frac{3}{2}$

- 6-120. Consider the function $y = 3(x+2)^2 - 7$ as you complete parts (a) through (c) below.

- How could you restrict the domain to show "half" of the graph?
- Find the equation for the inverse function for your "half" graph.
- What are the domain and range for the inverse function?



a) $x \geq -2$ or $x \leq -2$

b) for $x \geq -2$

$$x = 3(y+2)^2 - 7$$

$$x + 7 = 3(y+2)^2$$

$$\pm \sqrt{\frac{x+7}{3}} = y+2$$

$$y = \sqrt{\frac{x+7}{3}} - 2$$

Friday's CP's

6-109. Use the properties of logs to write each of the following expressions as a single logarithm, if possible.

a. $\log_{1/2}(4) + \log_{1/2}(2) - \log_{1/2}(5)$

b. $\log_2(M) + \log_3(N)$

c. $\log(k) + x \log(m)$

d. $\frac{1}{2} \log_5 x - 2 \log_5(x+1)$

e. $\log(4) - \log(3) + \log(\pi) + 3 \log(r)$

f. $\log(6) + 23$

$$\log 4 + \log \pi + \log r^3 - \log 3$$

$$\log \left(\frac{4\pi r^3}{3} \right)$$

6-110. What values must x have so that $\log(x)$ has a negative value? Justify your answer.

Look back at your warm up from today!

6-111. The fact that for any base m (when $m > 0$), $\log_m a + \log_m b = \log_m ab$ is called the **Product Property of Logarithms**. To prove that this property is true, follow the directions below.

- Since logarithms are the inverses of exponential functions, each of their properties can be derived from a similar property of exponents. Here, you are trying to prove that "logs turn products into sums." First, recall similar properties of exponents. If $a = m^x$ and $b = m^y$, write $a \cdot b$ as a power of m .
- Rewrite $a = m^x$, $b = m^y$, and your answer to part (a) in logarithmic form.
- In the third equation you wrote for part (b), substitute for x and y to obtain a log equation of base m that involves only the variables a and b .
- The property $\log_m a - \log_m b = \log_m \frac{a}{b}$ is called the **Quotient Property of Logarithms**. Use $a = m^x$ and $b = m^y$ to express $\frac{a}{b}$ as a power of m . Then use a similar process to rewrite each into log form and prove the Quotient Property of Logs.

a) Given: $a = m^x$ $b = m^y$

$$ab = m^x \cdot m^y$$

$$ab = m^{x+y}$$

b) $a = m^x$ $b = m^y$ $ab = m^{x+y}$

$$\log_m a = x \quad \log_m b = y \quad \log_m (ab) = x+y$$

c) $\log_m (ab) = \log_m a + \log_m b$

Review of Log Properties

A Logarithm is an exponent!

Definition: $\log_b a = x$ $b^x = a$

↑
exponent

Power Property: $\log_b a^x = x(\log_b a)$

like: $b^a \cdot b^c = b^{a+c}$

Product Property: $\log_b a + \log_b c = \log_b (ac)$

like: $\frac{b^a}{b^c} = b^{a-c}$

Quotient Property: $\log_b a - \log_b c = \log_b \left(\frac{a}{c}\right)$

Can't have anything
in front of log word.

Evaluate the log:

$$\log_2 16$$

4

$$\log_3 \frac{1}{27}$$

-3

$$\log_5 1$$

0

$$\log_7 7$$

1

$$\log_p p$$

1

$$\log_x 1$$

0



MATH NOTES

METHODS AND MEANINGS

p. 271

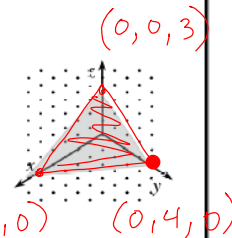
Graphing Planes in Three Dimensions

To graph a plane, it is easiest to use the intercepts to draw the “trace lines” (the intersections of the plane with the xy -, xz -, and yz -planes) that will represent the plane.

To find the intercepts, let two of the variables equal zero. Then solve to find the intercept corresponding to the remaining variable.

For example, for $2x + 3y + 4z = 12$, the x -intercept is found by letting y and z equal zero, which gives $2x = 12$. Therefore the x -intercept is $(6, 0, 0)$. Similarly, the y -intercept is $(0, 4, 0)$, and the z -intercept is $(0, 0, 3)$.

Drawing the line between two intercepts gives one of the trace lines in that coordinate plane. For example, connecting the x - and y -intercepts, you would get the equation $2x + 3y = 12$, which is the trace line in the xy -plane when $z = 0$ in the equation $2x + 3y + 4z = 12$. Connecting the x - and z -intercepts gives the trace line in the xz -plane, etc.



Solve: (Make the base match if possible!!!)

1. $3^{x+2} = 9^{5x}$

$$3^{x+2} = (3^2)^{5x}$$

$$3^{x+2} = 3^{10x}$$

$$x+2 = 10x$$

$$\frac{2}{9} = \frac{9x}{9}$$

$$x = \frac{2}{9}$$

2. $4^x = \frac{1}{32}$

$$(2^2)^x = 2^{-5}$$

$$2^{2x} = 2^{-5}$$

$$\frac{2x}{2} = -\frac{5}{2}$$

$$x = -\frac{5}{2}$$

3. $2^x = 34$

$$\log 2^x = \log 34$$

$$x \frac{\log 2}{\log 2} = \frac{\log 34}{\log 2}$$

$$x \approx 5.09$$

HW: 6- #130 ---> 136

Thursday's Quiz:

Graphing a point and
an equation in 3 variables.

Solving a 3 variable system.